Pacific Science (1979), vol. 33, no. 2
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# *Rhizophora* in the Society Islands[1]

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ABSTRACT: *Rhizophora stylosa* Griff. is recorded from Moorea and Bora Bora in the Society Islands. Earlier records from the Society Islands of *R. mangle* L. by Forster (1786) and *R. mucronata* Lam. by Gray (1854) are probably the result of mislabeling, and there is no evidence that the present stands of *Rhizophora* are not recent introductions.

ON CAPTAIN COOK'S second voyage of discovery (1772–1774) the naturalists on board the *Resolution* were J. R. and G. Forster. The latter published a list of plant records that included: "202 R. mangle, foliis acutis, fructibus sublatoclavatis M.S.V. p. 442 n. 5 Societatis, Amicorum, nouarum Hebridum insulae et nova Caledonia" (Forster 1786:35).

While *Rhizophora* still occurs in the Friendly Islands (Tonga), the New Hebrides, and New Caledonia, most botanists have regarded the Society Island record as erroneous. As far as I can discover, Guillemin (1836–1837) was the last person to cite this record. In the first part of his paper he lists *R. mangle* in his "liste des plantes qui existent simultanement dans l'Archipel de la Société et dans les autres Îles de la Mer du Sud," but *Rhizophora* is not mentioned in the subsequent enumeration of Tahitian plants.

A second record of *Rhizophora* in the Society Islands, this time of *R. mucronata* Lam., was made on the United States Exploring Expedition 1838–1842 (Gray 1854), but Gray considered the record to be the result of mislabeling.

## PRESENT DISTRIBUTION IN THE SOCIETY ISLANDS

In a guide to the Society Islands, T'Serstevens (1950) noted the presence of mangroves at Vaianahe Bay, Moorea, a record repeated by Papy (1956:189) in an account of the vegetation of Tahiti without, however, any suggestion that he had seen the plants. In September 1975 I visited this locality and confirmed the presence of *Rhizophora stylosa* Griff. Subsequently, I visited Bora Bora and recorded the same species at Aheatauiti Bay, near Anau.

On Moorea, 63 trees were counted. Although most were about 2 m high, there were well-grown trees up to 3 m high and numerous seedlings about 1 year old. There was only a narrow, discontinuous fringe of mangrove along the shore, which can be correlated with the low tidal range. (The mean range at spring tides is approximately 0.3 m.) The *Rhizophora* occurred on both sides of the bay, on coral sand to the west and on mud and in depressions in grassy (*Paspalum vaginatum* Swartz.) areas to the east. Associated with the trees was *Acrostichum aureum* L. Fiddler crabs (*Uca chlorophthalamus crassipes* Adams & White) were present in the substratum, with a mean of 35 crab holes/$m^2$ in the muddy areas and 5/$m^2$ in the coral sand. *Littorina scabra* L., a common Indo-Pacific gastropod on mangroves, was found on the leaves. Behind the *Rhizophora* were scattered trees of *Hibiscus tiliaceus* L., which is the dominant shoreline species elsewhere along the coast.

The Bora Bora locality was similar, but the trees were taller and all were growing on mud that supported a growth of *Halophila* sp. and a population of fiddler crabs. There was no *Acrostichum*, but there is a small fishing village to the rear of the site. There were no evident signs of clearing of the

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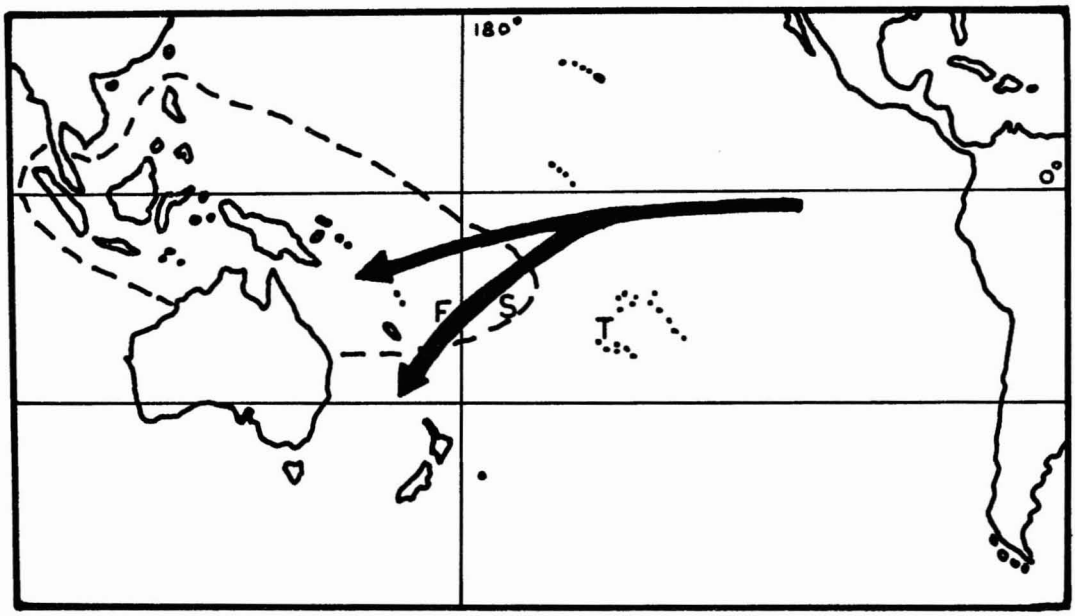


FIGURE 1. The distribution of *Rhizophora stylosa* (dotted line), based on Tomlinson (1978) and personal observations (1970). The broad arrows indicate the general direction of the south equatorial current. F, Fiji Islands; S, Samoa; T, Society Islands.

*Rhizophora* by the villagers, though a number of the larger branches had obviously been cut with an axe.

## DISCUSSION

T'Serstevens (1950) assumed that the Moorea *Rhizophora* population had been deliberately planted. I have been unable to trace any evidence for this. On Bora Bora the old local inhabitants declared that the *Rhizophora* had been there "toujours." However, there was a U.S. Naval Station at Anau during World War II (from 1942 to 1946), and it is possible that it was then introduced accidentally from elsewhere in the Pacific. M. Erwin Christian examined the file on this base for me, but found no references to mangroves.

The probability that *Rhizophora stylosa* reached the Society Islands by natural dispersal is low. The nearest locality is Samoa (where the plant is usually referred to as *R. mucronata* Lam., but this is the result of misidentification—Tomlinson 1978; personal observations 1970), which is 2400 km to the west (Figure 1). Although this distance is not excessive for an ocean passage by a genus adapted to marine conditions, the ocean currents in this part of the Pacific Ocean travel westward, so that any natural dispersal by floating would involve a considerably longer voyage. Nor does *R. stylosa* occur on the intermediate island group of the Cook Islands, although there are apparently suitable habitats. These are both arguments against a natural dispersal of the species to the Society Islands.

If Forster's (1786) and Gray's (1854) records of *Rhizophora* in the Society Islands were correct, it would raise the possibility that it had been overlooked for 100 years. It would also mean that the arrival of *Rhizophora* there predated European discovery, though this would not necessarily imply natural dispersal as it could have been introduced by early Polynesian voyagers as suggested by Chapman (1970) for *R. mangle* L. var. *samoensis* Hochr. in Fiji, Samoa, Tonga, and the New Hebrides.

*Rhizophora* is a Linnean genus, and Forster

would interpret the species in terms of *Species Plantarum* (Linnaeus 1753). Here Linnaeus recognized five species, of which four have subsequently been transferred to other mangrove genera. The one remaining species is *R. mangle*. More recent taxonomists have distinguished a number of other species, and in the latest revision, Hou (1960) recognized seven species, five of which occur in the Pacific. Though there is no general agreement on the status of several of the taxa, this is irrelevant to the present argument.

Forster's record of *Rhizophora mangle* could therefore have been of another taxon, possibly *R. stylosa*, and this is borne out by his mention of "foliis acutis," which is characteristic of the Pacific taxa other than *R. mangle* [and the Fijian/Samoan/Tongan/New Caledonian taxon variously included in *R. mangle* L. or *R. samoensis* (Hochr.) Salv., but which Tomlinson and Womersley (1976) recognize as *R. mangle* var. *samoensis* Hochr.]. *Rhizophora mangle* and *R. samoensis* have obtuse leaves. That Forster included these other species in his concept of *R. mangle* is made clear by his record of it from the New Hebrides (Forster 1786). In his account of the voyage (Forster 1777) the only mention of mangroves in the New Hebrides comes from Port Resolution on the southeastern corner of Malekula Island. The only *Rhizophora* species present at Port Resolution are *R. stylosa* and *R. apiculata* Blume (personal observations, 1974).

These problems could be cleared up by examination of Forster's specimen. Hou (1960) states that it is at Kew, and he examined it there (C. Kalkman *in litt.* 1977), but searches of the Pacific *Rhizophora* there have failed to reveal it (P. S. Green *in litt.* 1976; M. Bywater *in litt.* 1977). Correspondence with the herbaria indicated as having Forster material in Stafleu and Cowan (1976) has failed to bring any of his *Rhizophora* material to light. The only Forster mangrove material it revealed was a sheet of leaves labeled "*Rhizophora gymnorhiza*" [*Brugiera gymnorhiza* (L.) Lamk.] without locality or date, in the Systematisch-Geobotanisches Institut, Göttingen, and a single leaf with the same annotation and no date or locality in the Biological Faculty of the Lomonosar State University of Moscow. These presumably come from Tonga, as the only record for this species in Forster (1786) is "Namouka archipelagi, Amicorum."

Hou's statement is interesting in that the specimen could not be located 100 years ago. Seeman (1865–1873:92) comments: "Forster mentions a mangrove as occurring in the Society Islands, but there is no specimen from there." It may be that Seeman did not consult any plants at Kew, though this seems unlikely, for although he worked and consulted Forster's herbarium in the British Museum, he deposited his specimens at Kew.

There is another possible line of attack on the identification. Hou mentions that Forster's specimen bears the annotation "common name: wabitatin malabar." The linguistic origin of this name appears to be Melanesian rather than Polynesian. The general Polynesian term for mangroves is *tongo* (R. M. Clark *in litt.* 1977) [cf. *togolei* given by Yuncker (1959) as the local Tongan name for *R. samoensis*]. This suggests that the specimen was not Polynesian, and thus not Tahitian. Unfortunately, the limited amount of material available on the languages of New Caledonia and the New Hebrides [the only Melanesian localities given by Forster (1786) for *R. mangle*] does not permit a more definite localization at present.

In his account of the voyage Forster (1777) mentioned mangroves in Tonga, New Caledonia, and the New Hebrides, corresponding with his published records (Forster 1786), but he does not mention them while in the Society Islands. M. E. Hoare (*in litt.* 1977) examined Forster's unpublished journal and has confirmed that there is no mention there of mangroves in the Society Islands. On Tahiti, Forster botanized mainly around Point Venus. Mangroves do not grow there today and the shore there is not suitable for them (personal observations 1975). He did not visit either Moorea or Bora Bora, but did visit Huahine, which I was unable to visit.

*Rhizophora mucronata* and *R. stylosa* have been confused for many years, and Gray's (1854) record of the former could well be of the latter. Unfortunately, the specimen

was described as "a fragment," and again it has not been located in the U.S. National Herbarium at the Smithsonian Institution (J. J. White *in litt.* 1977), so that it is not possible to check the identification. Gray also notes that in his narrative of the voyage, Pickering does not mention mangroves in the Society Islands.

The two early records lead one to think that *Rhizophora stylosa* possibly did occur in the Society Islands 150–200 years ago and has been overlooked since. The very low (0.3 m) tidal range results in discontinuous stands of *Rhizophora* that could easily be missed by casual observers making short visits to the more remote islands. However, the absence of a mention of mangroves in the expedition journals suggests that the evidence is in favor of the mislabeling of the earlier specimens, though if there were only a few trees present, they might not merit a mention. There is thus no reason to suggest that the present stands are not recent introductions, though they already appear to have developed part of the characteristic mangrove fauna.

ACKNOWLEDGMENTS

I am grateful to all the correspondents who have replied to my queries, to the directors and staff of the various herbaria, and to P. B. Tomlinson for a draft of his paper on *Rhizophora*.

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